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A SIMPLE LABORATORY METHOD OF PRODUCING CONTINUOUS ULTRA-VIOLET LIGHT

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Plate VI

ABSTRACT. A convenient method of producing hydrogen continuum from visible to 2200 Å has been described. A diagram of the arrangement and a photograph of the continuum have also been given.

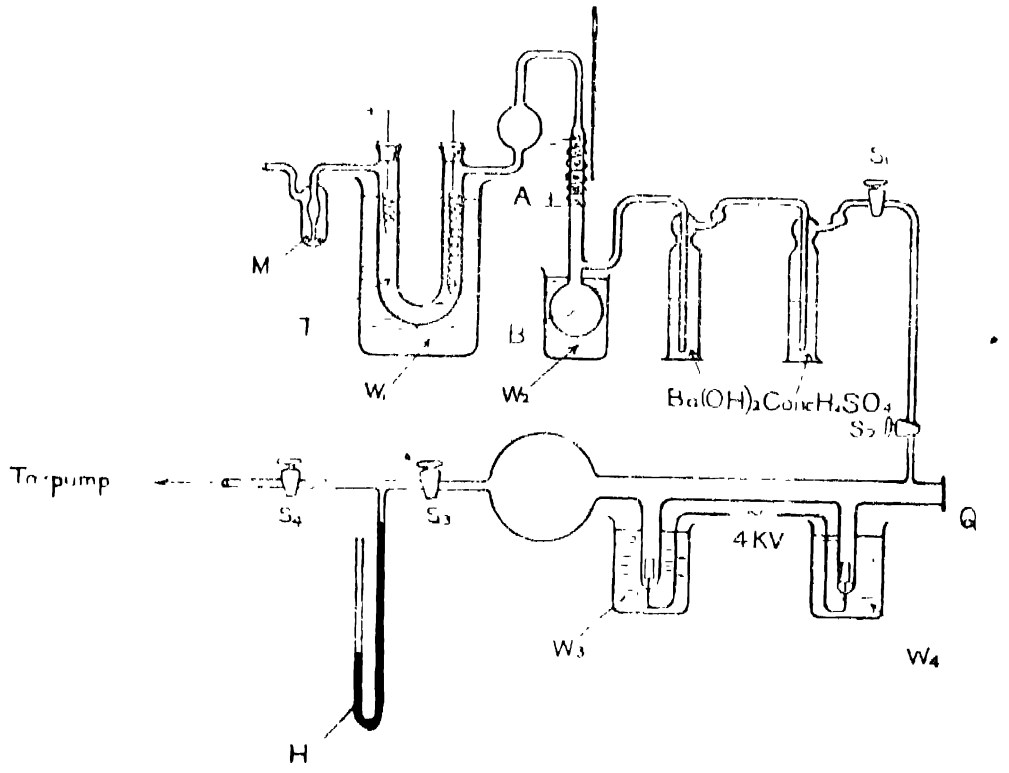
INTRODUCTION

These days one can buy a ready-made source of Hydrogen Continuum from Messrs. Adam Hilger & Co which gives a fairly extended continuous ultra-violet background. It will not be, however, out of place if a very cheap and simple method of obtaining almost the same result is described here. There are so many designs tried by different workers [1] but they are comparatively difficult and in some cases practically impossible to build in an ordinary laboratory workshop. The design tried here is due to Leifson[2] with only a slight modification. The apparatus can be assembled even in an ordinary laboratory. Also the working has been so simplified that the discharge gives nothing but continuous background whenever it glows. One need not be particular about pressure of hydrogen in the tube. In the hope that it may be of any help to the workers in this line a description of the apparatus with its working is given here.

DESCRIPTION

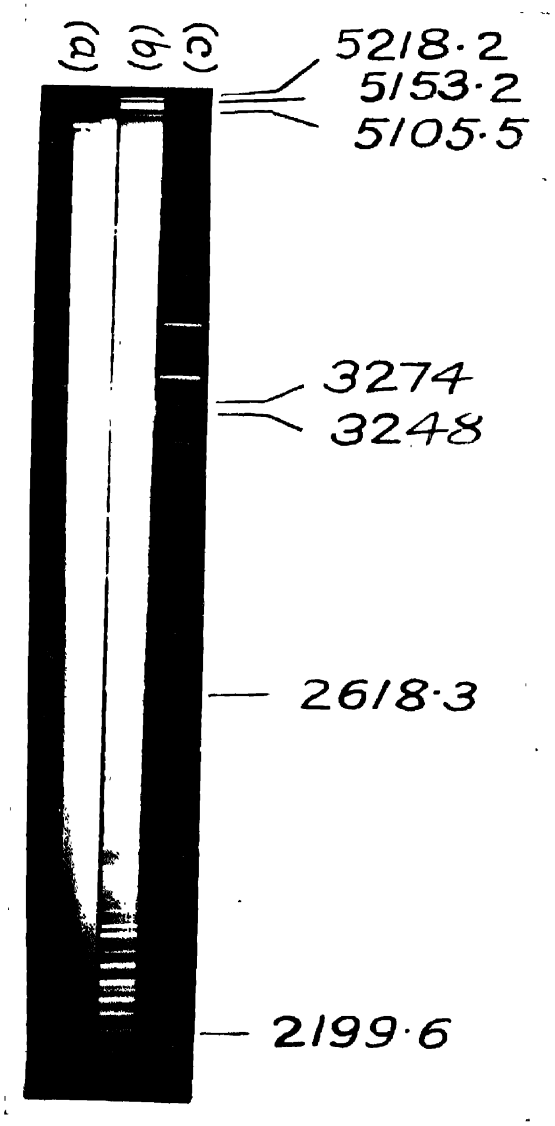
The apparatus is shown below in a schematic diagram. Hydrogen was generated by means of electrolysis of 20% solution of NaOH contained in the U-tube T, the electrodes employed being of Nickel. An electric current of 2 to 2·5 amperes from a D. C. main of 110 volts was used for electrolysis. In order to keep the U-tube cool it was put in a water bath W_1. The oxygen escaped by bubbling through mercury in the tube M and the hydrogen passed over platinised asbestos in the tube A heated to 100° C by an electric current through a coil of nichrome wire wound round the tube. The platinised asbestos acted as a catalytic agent in removing any trace of oxygen, which might come with hydrogen, in the form

of water which collected in the bulb B kept cool in the water bath W_2. Hydrogen bubbled through a bottle containing $Ba(OH)_2$ solution which absorbed any trace of CO_2. Finally the hydrogen was dried by passing through concentrated H_2SO_4. This method of preparing pure hydrogen is due to Bodenstein and Dux.[3] The discharge tube consists of pyrex-glass tubing one centimetre in diameter and attached to a flask of about 700 c.c. capacity. Aluminium electrodes (obtained from Tube Light Engineering Company) have been sealed, about 25 cm. apart, to the tube as shown in the diagram. To keep the electrodes cool they are immersed in seperate water baths W_1 and W_4. Q is a quartz window attached to the tube with hard sealing-wax. H is a mercury manometer.



The discharge tube was evacuated by means of an oil-air pump. Hydrogen was allowed to enter it by manipulating the stopcocks S_1 and S_2. Before starting the discharge the tube was thoroughly washed by repeating a number of times the process of evacuating the tube and refilling it with hydrogen. The potential applied to the electrodes of the discharge tube was 4 kv. from a transformer supplied by Messrs. Adam Hilger & Co. When hydrogen was not allowed to pass the discharge was due to the occluded gases coming out of the electrodes and the tube ; whereas, when the hydrogen was passing and the pump was running continuously the glow was entirely due to hydrogen, the occluded gases being

PLATE VI



carried away in the sweep. If the flow of hydrogen exceeded a certain rate the glow automatically ceased. Thus whenever there was a glow with maximum rate of flow of hydrogen the desired continuous light was obtained. One must be careful not to expose the plate when hydrogen is not flowing. In that case banded spectrum due to occluded gases is obtained.

There is, however, one disadvantage of this arrangement. The rate of generation of hydrogen is too slow. The quantity of hydrogen which collects in about 5 minutes flows away in about half a minute. Thus for every flow one has to wait for 5 minutes. Consequently for a total exposure of 15 minutes one has to expose 30 times at an interval of 5 minutes between consecutive exposures.

The photograph was taken with a small quartz-spectrograph. In the photograph (see plate VI), (*a*) is the continuous spectrum, (*b*) is the copper arc comparison and (*c*) is a spectrum with which we are not concerned here. The continuity extends from the visible to the shortest wavelength transmitted by the quartz window used

REFERENCES

[1] Lawrence and Edlefson, *Review of Sc. Inst.*, **1**, 45 (1930); Hopfield, *Astrophys. Jour.*, **72**, 137 (1930); Kistiakowsky, *Rev. Sc. Inst.*, **2**, 549 (1931); Urey, Murphy and Duncan, *Rev. Sc. Inst.*, **3**, 495 (1932); Rathenau, *Zeit. fur Phys.*, **32**, 87 (1933); Collins and Price, *Rev. Sc. Inst.*, **6**, 423 (1935).

[2] Leifson, *Astrophys. Jour.*, **63**, 73 (1926).

[3] Bodenstein and Dux, *Zeit. f. Phys. Chemie.*, **85**, 297 (1913).